CENTERS FOR DISEASE CONTROL

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MORBIDITY AND MORTALITY WEEKLY REPORT

Current Trends

Rubella Vaccination during Pregnancy — United States, 1971–1988

Since licensure of live attenuated rubella vaccine in 1969, the Immunization Practices Advisory Committee (ACIP) of the Public Health Service has stated that pregnancy is a contraindication to rubella vaccination because of concerns regarding the theoretical possibility of adverse effects on the developing fetus. Because of this concern and because the Cendehill and HPV-77 vaccine virus strains (introduced in 1969) could cause intrauterine rubella infections (*1*), CDC established in 1971 the Vaccine in Pregnancy (VIP) registry of women who had received either of these two rubella vaccines within 3 months before or after conception (*2*). None of the 290 infants born to the 538 women entered into this registry through April 1979 had defects indicative of congenital rubella syndrome (CRS); this included 94 live-born infants of women who were known to be susceptible* before receiving the vaccine (*3,4*).

In January 1979, the RA 27/3 rubella vaccine was licensed for use in the United States. Concerns were raised that this new live attenuated-virus vaccine might have greater fetotropic and teratogenic potential than the earlier vaccines because this virus was isolated from and propagated in human tissue. Thus, women known to be susceptible to rubella who received the RA 27/3 vaccine within 3 months of their estimated date of conception have subsequently been enrolled in the VIP registry. Throughout 1979–1987, an average of 30 susceptible women were enrolled annually; for 1988, 21 women were enrolled. From 1979 through December 31, 1988, final reports have been received for 272 enrollees from physicians and health departments in 49 reporting areas (including 46 of the 50 U.S. states, the District of Columbia, Puerto Rico, and Canada); the largest numbers of enrollees have been reported from California (34 enrollees [13% of the total]) and Georgia (33 [12% of the total]).

Outcomes of pregnancy are known for 254 (93%) of the 272 susceptible women enrolled between 1979 and 1988 (Table 1). Of these 254 women, 210 (83%) delivered 212 living infants, and 13 (5%) had spontaneous abortions; 31 (12%) pregnancies were terminated. The interval between date of vaccination and estimated date of

*Women who had had negative serologic tests for rubella within 1 year before vaccination were considered susceptible at vaccination.

Rubella Vaccination — Continued

conception is known for all 210 susceptible women who had full-term pregnancies (Figure 1). The median interval for these women was –14 days (i.e., they received vaccine 14 days before conception). Of the 212 live-born infants, the average gestational age at birth was 39.5 ± 2.0 weeks and the average birth weight was 3384 ± 521 grams. For the 13 women whose pregnancies ended in spontaneous abortions, the median interval between vaccination and conception was –13 days, and five (38%) were vaccinated during the period of highest risk.

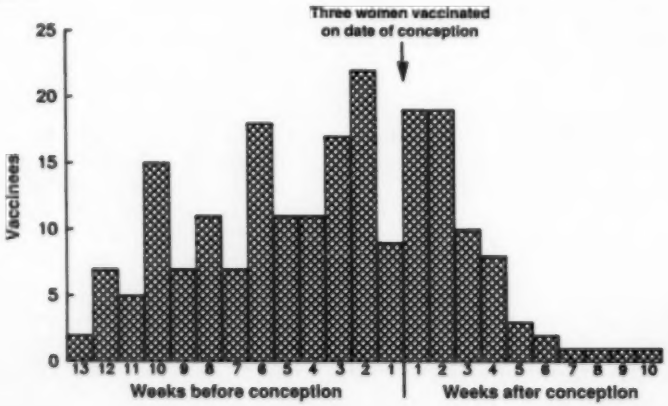
Findings were comparable when the subset of 92 women who were vaccinated within 1 week before to 4 weeks after conception (the period of presumed highest risk for viremia and fetal malformations [*5,6*]) was analyzed. Pregnancy outcomes were known for 88 (96%) of these women: 73 (83%) delivered 74 living infants, and five (6%) had spontaneous abortions; 10 (11%) pregnancies were terminated. Of the 74 live-born infants, the average gestational age at birth was 39.5 ± 2.1 weeks, and the average birth weight was 3257 ± 535 grams.

TABLE 1. Pregnancy outcomes for 683 recipients of RA 27/3 vaccine — United States, reported January 1979 through December 1988

Prevaccination immunity status	Total women	Live births	Spontaneous abortions and stillbirths	Induced abortions	Outcome unknown
Susceptible	272	212*	13	31	18
Immune	32	30	1	0	1
Unknown	379	320†	8	24	28
Total	**683**	**562**	**22**	**55**	**47**

*Includes two twin births.
†Includes one twin birth.

FIGURE 1. Interval between receipt of RA 27/3 vaccine and estimated date of conception



Rubella Vaccination — Continued

None of the 212 live-born infants had defects indicative of CRS. Although two infants had asymptomatic glandular hypospadias (which has been anecdotally suggested to be part of the CRS constellation of symptoms [*4*]), including one whose mother had been vaccinated within 1 week before her estimated date of conception, both had negative rubella-specific IgM titers† (<1:4) in cord blood at birth. A 6-month follow-up serum specimen, available for one of the infants, showed a rubella HI antibody titer of <1:8 (i.e., a negative titer).

Overall, serologic evaluations were performed on 154 (73%) of the 212 live-born infants, including 43 (58%) of the 74 infants who were exposed during the period of highest risk. Three (2%) of the 154 infants, including one (1%) infant born to a mother vaccinated during the period of highest risk, were normal on physical examination but had a positive rubella-specific IgM titer in cord blood, suggesting a subclinical infection. The first (infant A), born in 1981, had a rubella-specific IgM antibody titer of 1:8 in cord blood and an initial corresponding HI titer of 1:128. The maternal HI titer was also 1:128. Simultaneous retesting of the cord blood and testing of a follow-up specimen taken when the infant was 2 months old showed a decrease in HI antibody titer from 1:64 to 1:16 over the 2-month period, suggesting that the cord blood HI titer was passively transferred maternal antibody and that subclinical infection may not have occurred. Infant A had no defects indicative of CRS at 18-month and 29-month follow-up examinations. Since 1985, two additional apparently healthy infants had positive rubella IgM titers in cord serum. Infant B had an IgM EIA index of 1.9, and infant C (whose mother had been vaccinated within 4 weeks after her estimated date of conception) had an index of 2.9. Both mothers had positive IgM indices at delivery; mother B had an index of 4.2 on a serum specimen drawn 11 months after vaccination, and mother C had an index of 2.5 on a serum specimen drawn 9 months after vaccination. No clinical or serologic follow-up was available for either of these infants.

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Editorial Note: Data collected by CDC in the VIP registry since 1979 show no evidence that the RA 27/3 rubella vaccine administered in pregnancy can cause defects indicative of CRS. These data include information for 379 women whose immune status were not known, 32 immune women, and 272 women known to be susceptible at vaccination (*7*). Previous reviews of data collected before April 1979 on 538 women vaccinated during pregnancy with either Cendehill or HPV-77 rubella vaccines have shown no CRS-indicative outcomes (*2,3,8*). Therefore, the observed risk for CRS following rubella vaccination continues to be zero. These results are consistent with the experiences in the Federal Republic of Germany and the United Kingdom (*9,10*), where rubella vaccine has not been associated with CRS among infants born to susceptible mothers who were vaccinated around the time of conception.

†Since July 1985, the CDC laboratory has tested for rubella-specific IgM antibody using an indirect enzyme immunosorbent assay (EIA) with an enzyme-conjugated antihuman IgM serum. An IgM index is calculated for each serum specimen using a known low-positive IgM serum specimen as a reference standard. An IgM index ≥1.0 is considered positive, with increasing values indicating increasing antibody levels. Before July 1985, the CDC laboratory performed sucrose density gradient centrifugation and hemagglutination-inhibition (HI) tests for rubella-specific IgM.

Rubella Vaccination — Continued

Based on the 95% confidence limits of the binomial distribution, the theoretical maximal risk for CRS in the group of 212 live-born infants of susceptible women who received RA 27/3 vaccine is 1.7%; the overall maximal risk for all known susceptible women vaccinated during pregnancy with any of the three types of vaccine since 1971 is 1.2% (Table 2). If the analysis is limited to the 74 infants born to mothers vaccinated with RA 27/3 within 1 week before to 4 weeks after conception, the corresponding maximal theoretical risk is 4.9%. These estimates are less than the 20% or greater risk of CRS associated with maternal infection with wild rubella virus during the first trimester (*2,11*) and are comparable with the 2%–3% rate of major birth defects observed in the absence of exposure to rubella vaccine (*12*). A sample of approximately 375 susceptible women would be required to lower the overall maximal theoretical risk below 1% for receipt of the RA 27/3 vaccine, assuming that no CRS-like anomalies are observed. At the observed average rate of annual enrollment into the VIP registry, this sample size might be attained by 1992 for all women vaccinated within 3 months of conception; however, at this same rate of enrollment, a similar number of women vaccinated in the highest-risk period would not be enrolled until 2023. In either case, the maximal risk can never be lowered to zero.

Although no CRS-like defects have been noted, rubella vaccine viruses can cross the placenta and infect the fetus. The rubella virus isolation rate from the products of conception for the RA 27/3 vaccine was 3% (1/35), and the rate of virus isolation for Cendehill and HPV-77 vaccines was 20% (17/85) (*2*). Thus, because of this evidence and because the theoretical risk to the fetus, however small, cannot be absolutely ruled out, the ACIP continues to state: 1) pregnancy remains a contraindication to rubella vaccination because of the theoretical, albeit small, risk of CRS; 2) reasonable precautions should be taken to preclude vaccination of pregnant women, including asking women if they are pregnant, excluding those who say they are, and explaining the theoretical risks to the others; and 3) if vaccination occurs within 3 months before or after conception, the risk of CRS is so small as to be negligible; thus, inadvertent vaccination of a pregnant woman should not be a reason in itself to consider interruption of pregnancy. The patient and her physician, however, should make the final decision (*13*).

The results obtained from the VIP registry data also provide adequate support for the recommendations that routine laboratory screening for both pregnancy and rubella antibody is not necessary before administration of vaccine and that physicians

TABLE 2. Maximum theoretical risks of congenital rubella syndrome (CRS) following rubella vaccination in known susceptible women, by vaccine strain — United States, 1971–1988*

Vaccine strain	Susceptible vaccinees	Normal live births	Risk of CRS (%)	
			Observed	Theoretical§
RA 27/3	210	212†	0	0–1.7
Cendehill or HPV-77	94	94	0	0–3.8
Unknown	1	1	0	—
Total	**305**	**307**	**0**	**0–1.2**

*Through December 31, 1988. No women entered in the register after 1980 were vaccinated with Cendehill or HPV-77 vaccine.
†Includes two twin births.
§Based on the 95% confidence limits of the binomial distribution.

Rubella Vaccination — Continued

and other health-care personnel should offer rubella vaccine whenever they encounter a potentially susceptible[§] woman lacking contraindications for vaccination. Thus, the essential purposes for which the VIP registry was initiated have been accomplished. Therefore, as of April 30, 1989, CDC discontinued accepting new enrollees into the VIP registry. All women enrolled before that date will be followed to completion of their pregnancy, and the final data will be analyzed for a summary report. *However, all suspected cases of CRS, whether presumed to be due to wild-virus or vaccine-virus infection, should continue to be reported through state and local health departments.*

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[§]Persons are considered susceptible unless they can present documentation of laboratory evidence of immunity and/or documentation of adequate immunization with rubella vaccine on or after their first birthday (*13*).

Epidemiologic Notes and Reports

Acute Occupational Fatalities in a Foundry — Indiana, 1974–1986

On April 5, 1986, a 34-year-old worker at an iron foundry in Indiana died after acute overexposure to solvent fumes. Investigation of the episode revealed that five other acute work-related deaths attributable to other causes had occurred in the same foundry (average workforce, 250 persons) during the preceding 12 years. Based on an estimated total of 3250 person-years at risk for the workforce at the foundry from 1974–1986, the six fatalities correspond to a mortality rate of approximately 185 per

Occupational Fatalities — Continued

100,000 workers per year. In contrast, the fatal injury rate during 1980–1984 for the most hazardous U.S. industry, mining, is estimated to be 30.1 per 100,000 workers per year (Table 1) (*1*).

The event prompting this investigation was the death of a maintenance employee who was spraying a mixture of chlorinated solvents (primary constituent, 1,1,1-trichloroethane) to remove excess grease from machinery. The work was performed in an open-top pit measuring 28 feet long, 14 feet wide, and approximately 5 feet deep; one ladder was used for both entry and exit. Area ventilation, although available, was not in operation because of cold weather. The solvent was dispensed by a hand-held nozzle with two manual valves—one for the gravity-fed solvent, the other for the forced-air flow. Compressed air was mixed with the solvent in a nozzle at the end of the hose. The worker was spraying solvent through this nozzle immediately before death. The nozzle, which had no automatic cutoff, was still releasing solvent when the worker's body was discovered. Although CDC's National Institute for Occupational Safety and Health (NIOSH) recommends that workers wear a self-contained breathing apparatus or a supplied-air breathing apparatus when working in the presence of 1,1,1-trichloroethane, the worker was wearing a less protective chemical-cartridge, air-purifying respirator. The apparent cause of death, as recorded on the death certificate, was "acute over-exposure to solvents."

Follow-up investigation by NIOSH as part of its Fatal Accident Circumstances and Epidemiology program revealed that the Occupational Safety and Health Administration (OSHA) had cited this foundry in 1976 and 1979 for violations of OSHA regulations relating to respirators (NIOSH, unpublished data, 1986) and in 1983 for dispensing flammable solvents through valves without automatic cutoffs. Furthermore, this foundry did not appear to have followed the American Foundrymen's Society guidelines emphasizing the dangers of using organic solvents in confined spaces and of using chemical-cartridge, air-purifying respirators in oxygen-deficient atmospheres (such as below-ground pits) (*2*). The investigators concluded that the worker was wearing a respirator that was inappropriate for use with 1,1,1-trichloroethane in this setting.

The victims of the five other acute occupational fatalities occurring at this foundry since 1974 were males ranging in age from 19 to 46 years (age information is

TABLE 1. Average annual industry-specific fatality rates per 100,000 workers, from the National Traumatic Occupational Fatality database — United States, 1980–1984

Industry*	Fatality rate
Mining	30.1
Construction	23.1
Agriculture, Forestry, Fisheries	20.3
Transportation, Communication, Public utilities	19.5
Manufacturing†	4.2
Services	2.9
Retail trade	1.8
Finance, Insurance, Real estate	1.3
Wholesale trade	1.1

*Industries classified according to U.S. Office of Management and Budget, Standard Industrial Classification System, 1972 edition.
†Includes foundry workers.

Occupational Fatalities — Continued

unavailable for one victim) (Table 2). These events are briefly summarized: 1) In October 1974, a casting fell through an internal roof from an overhead conveyor line, striking a 30-year-old worker and causing fatal head injuries. 2) In April 1976, a grinding wheel shattered and fatally injured a 32-year-old worker. 3) In September 1978, a 19-year-old maintenance worker was fatally injured when he was caught in machinery he was greasing. 4) In May 1979, a 46-year-old maintenance supervisor was electrocuted when he touched an energized 440-volt line. 5) In 1979, a worker suffered a fatal cardiac event after working for a short period inside an electric furnace from which molten metal had been drained 6–8 hours earlier; although the temperature of the furnace at the time the worker entered could not be reliably estimated, the normal operating temperature in this furnace is 2800 F.

The investigators made specific recommendations to address the safety problems at this foundry (NIOSH, unpublished data, 1986). No further fatal injuries have been reported.

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Editorial Note: Acute trauma is a major cause of occupational death and disability. NIOSH has listed "severe acute traumatic injuries" as one of the 10 leading work-related diseases and injuries (*3*). Based on the National Traumatic Occupational Fatality database recently established by NIOSH to gather complete information about work-related traumatic deaths, acute occupational trauma accounts for at least 7000 deaths per year in the United States (*1*).

According to the safety records of the International Molders and Allied Workers Union, the union representing the workers at this foundry, at least 132 fatalities have occurred since 1972 at worksites (primarily foundries and smelters) where its members are employed; 84 of these resulted from injuries, and the others were caused by myocardial infarctions and strokes. One fatality occurred at each of 47 sites, two fatalities at each of 10 sites, and four deaths at each of three sites. Only the foundry described had five or more fatalities reported.

Pouring molten metal into molds to produce castings is the basic process of foundry work and is inherently hazardous. Foundry work (along with work in shipyards, sawmills, logging, and petroleum extraction) ranks among job categories with the highest rates of nonfatal injuries (*4,5*). Because of the relatively small number of foundry workers, no reliable fatal injury rates are available for the category "foundry work" within the manufacturing industry. Estimated industry-specific fatal-

TABLE 2. Acute occupational fatalities* reported at a foundry — Indiana, 1974–1986

Year	Age (yrs)	Means of death
1974	30	Struck by falling object
1976	32	Struck by fragments from shattered grinding wheel
1978	19	Caught in machinery
1979	46	Electrocuted
1979	—†	Suffered acute cardiac event after exposure to heat stress
1986	34	Acutely over-exposed to solvents

*All fatalities occurred in men.
†Age unavailable.

Occupational Fatalities — Continued

ity rates for traumatic deaths per 100,000 full-time workers per year in the United States vary widely by occupational group (from 1.1 for wholesale trade to 30.1 for mining) (Table 1) (*1*). The fatality rate in general manufacturing is 4.2 deaths per 100,000 workers per year. The annual fatality rate for traumatic injury calculated for this foundry, approximately 185 per 100,000 workers per year, is over five times as high as the fatality rate for mining (30.1 per 100,000), the most hazardous occupation ($p = 0.002$, Poisson).

A traumatic death in the workplace is a "sentinel health event (occupational)" (*6*) and strongly suggests that the existing safety system has failed and preventive action is warranted. Investigation of an occupational fatality can identify causative factors and lead to the implementation of intervention strategies to reduce the risk of injury. To protect against illness, injury, and death, the workplace should be systematically explored to determine any consistent pattern of risk and opportunity for improved prevention. This reported foundry investigation uncovered a series of fatal events and revealed deficiencies in management of the safety program in the workplace. The specific causes of these six fatalities varied, but the cluster of fatal events in so small a workforce indicates a need for intervention and preventive action.

These occupational deaths in a foundry also illustrate several well-known occupational risks: working in confined spaces (*7*), electrocution, improperly guarded machinery, heavy falling objects, and acute cardiovascular stress due to heat. NIOSH (*8–10*), OSHA (*11*), the American National Standards Institute (*12–14*), and the American Foundrymen's Society (*2*) each have published standards and/or recommendations for controlling these hazards.

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Recommendations of the Immunization Practices Advisory Committee (ACIP)

Prevention and Control of Influenza: Part I, Vaccines

These recommendations update information on the vaccine available for controlling influenza during the 1989–90 influenza season (superseding *MMWR* 1988;37:361–73). Changes include statements about 1) updating of the influenza strains in the trivalent vaccine for 1989–90, 2) revision of the high-priority groups for immunization, 3) increased emphasis on the need for vaccination of health-care workers and household contacts of high-risk persons, 4) vaccination for travelers, and 5) review of strategies for reaching high-risk groups with vaccine.

Antiviral agents also have an important role in the control of influenza. Recommendations for the use of antiviral agents will be published in the summer or fall of 1989 as Part II of these recommendations.

INTRODUCTION

Influenza A viruses are classified into subtypes on the basis of two antigens: hemagglutinin (H) and neuraminidase (N). Three subtypes of hemagglutinin (H1, H2, H3) and two subtypes of neuraminidase (N1, N2) are recognized among influenza A viruses that have caused widespread human disease. Immunity to these antigens, especially the hemagglutinin, reduces the likelihood of infection and lessens the severity of disease if infection occurs. However, over time, there may be enough antigenic variation (antigenic drift) within the same subtype that infection or vaccination with one strain may not induce immunity to distantly related strains of the same subtype. Although influenza B viruses have shown more antigenic stability than influenza A viruses, antigenic variation does occur. For these reasons, major epidemics of respiratory disease caused by new variants of influenza continue to occur. The antigenic characteristics of current strains provide the basis for selecting virus strains included in each year's vaccine.

Typical influenza illness is characterized by abrupt onset of fever, sore throat, and nonproductive cough. Unlike many other common respiratory infections, influenza can cause extreme malaise lasting several days. More severe illness can result if the influenza virus invades the lungs (primary viral pneumonia) or if secondary bacterial pneumonia occurs. High attack rates of acute illness during influenza epidemics

ACIP: Influenza — Continued

usually result in dramatic increases in visits to physicians' offices, walk-in clinics, and emergency rooms by persons of all ages and in increases in hospitalizations for management of lower-respiratory-tract complications.

Elderly persons and persons with underlying health problems are at increased risk for complications of influenza infection. Such high-risk persons are more likely than the general population to require hospitalization if infected. One recent study showed that, during major epidemics, hospitalization rates for high-risk adults increased twofold to fivefold, depending on age group. Previously healthy children and younger adults may also require hospitalization for influenza-related complications, but the relative increase in their hospitalization rates is less than for persons in high-risk groups.

(Continued on page 303)

TABLE I. Summary — cases of specified notifiable diseases, United States

Disease	17th Week Ending			Cumulative, 17th Week Ending		
	April 29, 1989	April 30, 1988	Median 1984-1988	April 29, 1989	April 30, 1988	Median 1984-1988
Acquired Immunodeficiency Syndrome (AIDS)	529	U*	181	11,128	9,923	4,128
Aseptic meningitis	68	65	81	1,281	1,312	1,312
Encephalitis: Primary (arthropod-borne & unspec)	7	9	10	191	219	268
Post-infectious	1	5	4	24	32	32
Gonorrhea: Civilian	9,213	13,231	15,188	208,231	218,158	264,015
Military	328	337	337	3,704	4,154	5,602
Hepatitis: Type A	593	419	434	10,880	8,075	7,356
Type B	435	481	495	6,680	6,965	7,999
Non A, Non B	45	62	80	752	851	1,119
Unspecified	34	51	92	795	710	1,535
Legionellosis	13	11	15	277	268	211
Leprosy	4	6	7	46	60	73
Malaria	25	3	17	327	217	230
Measles: Total†	355	48	141	3,261	766	1,023
Indigenous	346	48	129	3,067	668	905
Imported	9	-	12	194	98	118
Meningococcal infections	61	69	62	1,152	1,227	1,185
Mumps	87	131	77	1,823	1,844	1,368
Pertussis	27	27	27	542	731	694
Rubella (German measles)	10	7	13	100	72	135
Syphilis (Primary & Secondary): Civilian	803	997	645	13,205	12,330	9,290
Military	7	2	5	99	85	71
Toxic Shock syndrome	13	3	9	118	103	123
Tuberculosis	442	380	444	6,162	5,976	6,359
Tularemia	1	2	2	15	30	27
Typhoid Fever	13	4	6	131	109	90
Typhus fever, tick-borne (RMSF)	3	3	5	29	24	27
Rabies, animal	100	80	105	1,439	1,240	1,588

TABLE II. Notifiable diseases of low frequency, United States

	Cum. 1989		Cum. 1989
Anthrax	-	Leptospirosis (Hawaii 2)	38
Botulism: Foodborne	6	Plague	-
Infant (Ohio 1)	4	Poliomyelitis, Paralytic	-
Other	3	Psittacosis	30
Brucellosis (Calif. 1)	12	Rabies, human	-
Cholera	-	Tetanus (Calif. 1)	15
Congenital rubella syndrome	1	Trichinosis (Calif. 1)	11
Congenital syphilis, ages <1 year	-		
Diphtheria	-		

*Because AIDS cases are not received weekly from all reporting areas, comparison of weekly figures may be misleading.
†Two of the 355 reported cases for this week were imported from a foreign country or can be directly traceable to a known internationally imported case within two generations.

TABLE III. Cases of specified notifiable diseases, United States, weeks ending April 29, 1989 and April 30, 1988 (17th Week)

Reporting Area	AIDS	Aseptic Meningitis	Encephalitis		Gonorrhea (Civilian)		Hepatitis (Viral), by type				Legionellosis	Leprosy
			Primary	Post-infectious			A	B	NA,NB	Unspecified		
	Cum. 1989	Cum. 1989	Cum. 1989	Cum. 1989	Cum. 1989	Cum. 1988	Cum. 1989	Cum. 1989	Cum. 1989	Cum. 1989	Cum. 1989	Cum. 1989
UNITED STATES	11,128	1,261	191	24	208,231	218,158	10,880	6,680	752	795	277	46
NEW ENGLAND	470	54	5	1	5,737	6,589	225	367	34	31	22	3
Maine	24	2	1	-	87	149	4	15	3	1	3	-
N.H.	11	1	-	-	64	103	27	22	6	3	-	-
Vt.	4	-	-	-	24	52	9	25	4	-	-	-
Mass.	262	23	2	1	2,263	2,354	79	221	13	21	13	3
R.I.	22	19	-	-	484	588	7	33	3	2	6	-
Conn.	147	9	2	-	2,815	3,343	99	51	5	4	-	-
MID. ATLANTIC	3,329	184	36	2	29,510	35,020	1,528	1,041	76	93	78	5
Upstate N.Y.	484	79	9	1	5,223	4,079	371	256	31	3	25	1
N.Y. City	1,689	25	2	1	12,637	16,400	123	325	13	75	8	2
N.J.	766	-	25	-	4,563	4,958	146	181	11	5	12	1
Pa.	390	80	-	-	7,087	9,583	888	279	21	10	33	1
E.N. CENTRAL	837	164	60	-	36,101	34,391	614	813	74	31	72	1
Ohio	156	49	15	-	9,853	7,954	139	185	11	4	43	-
Ind.	169	47	20	-	2,403	2,643	35	137	12	9	13	1
Ill.	327	4	2	-	10,969	9,800	276	173	13	11	-	-
Mich.	151	54	18	-	10,429	11,058	117	226	26	7	12	-
Wis.	34	10	5	-	2,447	2,936	47	92	12	-	4	-
W.N. CENTRAL	265	49	5	2	9,224	8,798	316	249	24	3	6	1
Minn.	56	5	-	1	972	1,184	30	40	4	2	2	-
Iowa	24	9	2	-	830	650	28	14	5	-	2	-
Mo.	133	15	-	-	5,513	4,976	180	168	9	1	-	-
N. Dak.	3	3	1	-	40	64	3	9	3	-	-	-
S. Dak.	3	3	1	-	90	187	2	3	3	-	-	-
Nebr.	11	3	1	-	499	537	46	10	-	-	2	1
Kans.	35	11	-	1	1,280	1,200	27	5	-	-	-	-
S. ATLANTIC	2,214	283	24	4	59,212	60,487	880	1,346	106	111	34	-
Del.	34	9	1	-	973	867	18	51	-	1	3	-
Md.	239	29	4	-	6,731	6,352	205	248	12	13	10	-
D.C.	188	5	-	-	3,721	4,078	2	6	1	-	-	-
Va.	204	57	12	-	4,941	4,241	61	92	18	57	1	-
W. Va.	13	2	3	-	451	527	8	26	2	2	-	-
N.C.	157	37	-	1	8,950	9,202	166	352	39	-	10	-
S.C.	85	8	-	-	5,328	4,461	13	147	3	4	2	-
Ga.	326	21	1	-	11,588	11,840	122	138	7	4	3	-
Fla.	968	115	3	3	16,529	18,919	265	284	24	30	5	-
E.S. CENTRAL	277	127	13	1	17,152	16,581	100	461	57	1	8	-
Ky.	42	33	4	1	1,639	1,377	44	129	21	-	2	-
Tenn.	94	17	-	-	5,533	5,517	23	248	15	-	4	-
Ala.	76	61	9	-	5,469	5,587	26	80	20	1	2	-
Miss.	65	16	-	-	4,511	4,100	7	6	1	-	-	-
W.S. CENTRAL	991	91	20	2	22,735	24,898	1,244	588	49	182	18	9
Ark.	25	3	-	-	2,335	2,239	68	25	2	2	1	-
La.	145	10	2	-	4,852	5,337	85	102	5	1	4	-
Okla.	59	13	6	-	2,022	2,231	142	61	9	8	10	-
Tex.	762	65	12	2	13,526	15,091	949	410	33	171	3	9
MOUNTAIN	366	44	6	1	4,220	4,613	1,601	416	79	68	15	1
Mont.	1	-	-	-	61	134	15	15	1	-	2	1
Idaho	8	-	-	-	74	133	68	28	5	2	-	-
Wyo.	8	-	-	-	44	73	7	1	-	-	-	-
Colo.	140	15	1	1	919	1,068	238	70	28	35	2	-
N. Mex.	23	4	-	-	447	457	189	70	17	1	-	-
Ariz.	95	20	2	-	1,497	1,620	844	141	14	26	7	-
Utah	22	4	1	-	152	217	102	28	9	3	3	-
Nev.	69	1	2	-	1,026	911	136	63	5	1	1	-
PACIFIC	2,379	265	22	11	24,340	26,781	4,392	1,389	253	275	24	26
Wash.	198	-	-	-	1,908	2,321	890	246	64	13	2	1
Oreg.	77	-	-	-	886	977	730	127	30	6	1	-
Calif.	2,075	248	19	11	21,086	22,891	2,364	997	154	252	19	21
Alaska	4	-	2	-	300	350	367	17	5	2	1	-
Hawaii	25	17	1	-	158	242	41	2	-	2	1	4
Guam	-	-	-	-	-	50	-	-	-	-	-	-
P.R.	550	34	1	-	325	495	34	72	5	7	-	7
V.I.	15	-	-	-	189	124	-	4	-	-	-	-
Amer. Samoa	-	-	-	-	-	20	-	-	-	-	-	-
C.N.M.I.	-	-	-	-	-	18	-	-	-	-	-	-

N: Not notifiable U: Unavailable C.N.M.I.: Commonwealth of the Northern Mariana Islands

TABLE III. (Cont'd.) Cases of specified notifiable diseases, United States, weeks ending April 29, 1989 and April 30, 1988 (17th Week)

Reporting Area	Malaria	Measles (Rubeola)					Menin-gococcal Infections	Mumps		Pertussis			Rubella		
		Indigenous		Imported*		Total									
	Cum. 1989	1989	Cum. 1989	1989	Cum. 1989	Cum. 1988	Cum. 1989	1989	Cum. 1989	1989	Cum. 1989	Cum. 1988	1989	Cum. 1989	Cum. 1988
UNITED STATES	327	346	3,067	9	194	766	1,152	87	1,823	27	542	731	10	100	72
NEW ENGLAND	18	9	31	5	10	45	88	6	18	-	15	77	-	-	1
Maine	-	-	-	-	-	-	11	-	-	-	4	11	-	-	-
N.H.	1	-	1	-	-	43	10	-	9	-	5	22	-	-	-
Vt.	-	-	1	-	-	-	5	-	-	-	2	1	-	-	-
Mass.	11	9	9	5§	8	1	40	6	8	-	-	33	-	-	-
R.I.	4	-	18	-	2	-	1	-	-	-	2	1	-	-	1
Conn.	2	-	2	-	-	1	21	-	1	-	2	9	-	-	-
MID. ATLANTIC	95	13	143	1	87	194	180	13	72	3	43	22	1	3	7
Upstate N.Y.	13	5	13	1†	73	3	47	2	22	2	23	6	-	1	1
N.Y. City	15	2	22	-	13	21	23	3	8	1	2	1	1	2	4
N.J.	11	-	80	-	-	2	35	-	11	-	14	3	-	-	1
Pa.	16	6	27	-	1	168	55	8	31	-	4	10	-	-	1
E.N. CENTRAL	16	100	546	-	38	53	121	8	161	10	37	84	5	12	20
Ohio	6	42	329	-	35	3	60	-	8	-	1	16	-	2	-
Ind.	2	-	-	-	-	-	16	-	16	-	11	36	-	-	-
Ill.	4	58	217	-	-	37	15	1	57	-	-	3	5	9	16
Mich.	2	-	-	-	1	13	23	7	65	10	18	14	-	-	4
Wis.	2	-	-	-	2	-	7	-	13	-	7	13	-	1	-
W.N. CENTRAL	7	-	167	-	2	-	30	3	248	-	15	35	1	2	-
Minn.	5	-	-	-	-	-	8	-	-	-	-	5	-	-	-
Iowa	-	-	-	-	1	-	-	1	11	-	6	14	-	-	-
Mo.	1	-	132	-	-	-	7	2	37	-	7	5	-	1	-
N. Dak.	1	-	-	-	-	-	-	-	-	-	-	6	-	-	-
S. Dak.	-	-	-	-	-	-	4	-	-	-	1	2	-	-	-
Nebr.	-	-	-	-	-	-	9	-	2	-	-	-	-	-	-
Kans.	-	-	35	-	1	-	2	-	198	-	1	3	1	1	-
S. ATLANTIC	80	5	189	1	14	188	183	5	289	2	53	67	-	2	3
Del.	1	-	-	-	-	-	2	-	-	-	-	3	-	-	-
Md.	14	-	5	-	6	3	30	-	151	-	5	12	-	1	-
D.C.	3	5	5	1†	3	-	8	2	50	-	-	-	-	-	-
Va.	8	-	-	-	2	67	21	-	53	1	4	9	-	-	-
W. Va.	1	-	-	-	-	6	8	1	8	-	9	-	-	-	-
N.C.	9	-	143	-	-	1	26	-	7	-	13	23	-	-	-
S.C.	1	-	-	-	-	-	13	-	7	-	-	-	-	-	-
Ga.	4	-	-	-	-	-	31	1	2	1	5	14	-	-	-
Fla.	19	-	16	-	3	91	44	1	11	-	17	6	-	1	3
E.S. CENTRAL	3	-	4	-	-	7	31	1	69	2	26	11	-	1	-
Ky.	-	-	2	-	-	-	19	-	9	-	1	-	-	-	-
Tenn.	-	-	1	-	-	-	2	-	21	-	8	7	-	1	-
Ala.	2	-	1	-	-	-	8	1	6	2	19	2	-	-	-
Miss.	1	-	-	-	-	7	2	N	N	-	-	2	-	-	-
W.S. CENTRAL	15	199	1,646	-	21	9	87	36	715	1	21	31	-	11	3
Ark.	-	-	-	-	-	-	3	4	71	1	9	5	-	-	2
La.	1	-	6	-	-	-	19	13	237	-	4	2	-	5	-
Okla.	1	-	23	-	-	8	7	-	140	-	8	24	-	1	1
Tex.	13	199	1,617	-	21	1	58	19	267	-	-	-	-	5	-
MOUNTAIN	12	18	36	2	15	109	33	2	76	4	248	278	-	2	2
Mont.	-	-	12	-	1	-	1	-	2	-	-	1	-	1	-
Idaho	2	-	-	-	1	-	-	-	6	3	30	227	-	-	-
Wyo.	1	-	-	-	-	-	-	-	4	-	-	1	-	-	-
Colo.	1	12	16	-	1	109	12	-	5	-	17	7	-	-	1
N. Mex.	1	6	7	2§	12	-	1	N	N	-	4	2	-	-	-
Ariz.	4	-	1	-	-	-	17	2	52	-	190	18	-	-	-
Utah	-	-	-	-	-	-	2	-	3	1	6	21	-	-	-
Nev.	3	-	-	-	-	-	-	-	4	-	1	1	-	1	1
PACIFIC	141	2	325	-	7	181	419	13	175	5	82	126	3	67	36
Wash.	5	-	-	-	1	-	38	2	15	3	19	26	-	-	-
Oreg.	7	-	-	-	-	1	31	N	N	-	4	1	-	-	-
Calif.	127	-	322	-	3	178	346	10	153	2	57	76	3	53	30
Alaska	2	-	-	-	-	-	3	-	-	-	-	3	-	-	-
Hawaii	-	2	3	-	3	2	1	1	7	-	2	20	-	14	6
Guam	-	U	-	U	-	1	-	U	-	U	-	-	U	-	1
P.R.	-	55	272	-	-	109	2	-	1	-	2	5	-	4	-
V.I.	-	-	-	-	-	-	-	1	6	-	-	-	-	-	-
Amer. Samoa	-	U	-	U	-	-	-	U	-	U	-	-	U	-	-
C.N.M.I.	-	U	-	U	-	-	-	U	-	U	-	-	U	-	-

*For measles only, imported cases includes both out-of-state and international importations.
N: Not notifiable U: Unavailable †International §Out-of-state

TABLE III. (Cont'd.) Cases of specified notifiable diseases, United States, weeks ending April 29, 1989 and April 30, 1988 (17th Week)

Reporting Area	Syphilis (Civilian) (Primary & Secondary)		Toxic-shock Syndrome	Tuberculosis		Tula-remia	Typhoid Fever	Typhus Fever (Tick-borne) (RMSF)	Rabies, Animal
	Cum. 1989	Cum. 1988	Cum. 1989	Cum. 1989	Cum. 1988	Cum. 1989	Cum. 1989	Cum. 1989	Cum. 1989
UNITED STATES	13,205	12,330	118	6,162	5,976	15	131	29	1,439
NEW ENGLAND	486	335	4	134	114	-	10	-	1
Maine	3	5	2	3	3	-	-	-	-
N.H.	2	3	-	4	-	-	-	-	-
Vt.	-	-	-	2	-	-	-	-	-
Mass.	155	138	-	73	73	-	5	-	-
R.I.	13	12	-	18	9	-	4	-	-
Conn.	313	177	2	34	29	-	1	-	1
MID. ATLANTIC	2,659	2,486	22	1,237	1,127	1	35	4	190
Upstate N.Y.	240	174	3	83	185	-	4	2	4
N.Y. City	1,377	1,629	2	729	523	-	22	-	-
N.J.	409	287	5	196	205	-	6	-	-
Pa.	633	396	12	229	214	1	3	2	186
E.N. CENTRAL	505	397	17	685	711	1	13	2	25
Ohio	38	44	8	129	131	-	2	1	-
Ind.	19	18	4	52	75	-	1	1	2
Ill.	212	200	-	303	293	-	6	-	4
Mich.	217	122	5	170	170	-	3	-	4
Wis.	19	13	-	31	42	1	1	-	15
W.N. CENTRAL	107	77	21	173	188	3	4	1	184
Minn.	7	8	6	40	30	-	1	-	42
Iowa	13	9	3	27	14	-	2	1	63
Mo.	51	40	3	82	83	3	1	-	15
N. Dak.	1	1	-	6	4	-	-	-	10
S. Dak.	-	-	3	12	15	-	-	-	32
Nebr.	15	13	5	6	4	-	-	-	12
Kans.	20	6	1	20	18	-	-	-	20
S. ATLANTIC	4,823	4,388	10	1,301	1,389	1	9	14	427
Del.	54	49	-	7	16	-	2	-	11
Md.	255	233	-	111	143	-	1	1	105
D.C.	277	196	-	57	62	-	2	-	2
Va.	184	139	1	122	146	1	1	-	88
W. Va.	4	1	-	30	32	-	-	-	24
N.C.	293	256	4	125	98	-	2	12	-
S.C.	251	209	2	132	135	-	-	1	68
Ga.	1,020	708	2	184	214	-	-	-	74
Fla.	2,485	2,575	1	533	523	-	1	-	55
E.S. CENTRAL	876	697	1	512	470	1	1	5	134
Ky.	19	22	-	136	133	1	1	4	66
Tenn.	381	303	-	129	100	-	-	-	32
Ala.	289	194	1	159	155	-	-	1	36
Miss.	187	178	-	88	82	-	-	-	-
W.S. CENTRAL	1,713	1,310	7	697	730	4	6	1	244
Ark.	110	61	-	83	71	2	-	-	33
La.	396	247	-	72	113	-	1	-	4
Okla.	27	49	5	59	70	2	-	1	33
Tex.	1,180	953	2	483	476	-	5	-	174
MOUNTAIN	256	237	9	151	131	2	1	1	64
Mont.	-	2	-	5	-	-	-	-	28
Idaho	-	-	1	4	-	-	-	-	-
Wyo.	1	1	-	-	1	-	-	-	19
Colo.	41	30	-	2	20	1	-	1	-
N. Mex.	11	19	1	27	34	-	-	-	9
Ariz.	67	63	6	77	58	-	1	-	7
Utah	8	8	-	17	-	1	-	-	-
Nev.	128	114	1	19	18	-	-	-	1
PACIFIC	1,780	2,425	27	1,272	1,156	2	52	1	160
Wash.	81	73	1	67	74	-	-	-	-
Oreg.	97	100	-	46	40	-	4	1	-
Calif.	1,584	2,235	25	1,091	979	2	48	-	107
Alaska	3	5	-	16	11	-	-	-	53
Hawaii	5	12	1	52	52	-	2	-	-
Guam	-	-	-	-	7	-	-	-	-
P.R.	168	212	-	78	74	-	-	-	15
V.I.	1	1	-	3	3	-	-	-	-
Amer. Samoa	-	-	-	-	3	-	-	-	-
C.N.M.I.	-	1	-	-	8	-	-	-	-

U: Unavailable

TABLE IV. Deaths in 121 U.S. cities,* week ending April 29, 1989 (17th Week)

Reporting Area	All Causes, By Age (Years)						P&I**
	All Ages	>65	45-64	25-44	1-24	<1	Total
NEW ENGLAND	620	412	123	46	19	20	56
Boston, Mass.	191	116	46	15	6	8	24
Bridgeport, Conn.	40	29	5	4	1	1	1
Cambridge, Mass.	26	17	5	2	1	1	3
Fall River, Mass.	30	23	5	2	-	-	2
Hartford, Conn.	44	28	10	5	-	1	3
Lowell, Mass.	16	11	2	3	-	-	2
Lynn, Mass.	12	9	3	-	-	-	2
New Bedford, Mass.	23	16	6	1	-	-	2
New Haven, Conn.	62	39	10	8	3	2	6
Providence, R.I.	41	29	8	3	-	1	-
Somerville, Mass.	7	7	-	-	-	-	-
Springfield, Mass.	40	22	10	3	4	1	5
Waterbury, Conn.	24	21	3	-	-	-	1
Worcester, Mass.	64	45	10	-	4	5	5
MID. ATLANTIC	3,167	2,104	634	295	63	71	202
Albany, N.Y.	46	35	8	2	-	1	1
Allentown, Pa.	14	12	2	-	-	-	1
Buffalo, N.Y.	110	71	25	12	-	2	9
Camden, N.J.	47	28	11	4	2	2	-
Elizabeth, N.J.	35	27	3	4	1	-	4
Erie, Pa.†	44	32	9	1	1	1	4
Jersey City, N.J.	78	49	9	14	3	3	5
N.Y. City, N.Y.	1,343	860	267	161	34	21	71
Newark, N.J.	59	22	22	12	1	2	7
Paterson, N.J.	33	18	6	5	-	4	-
Philadelphia, Pa.	987	667	209	66	20	25	64
Pittsburgh, Pa.†	70	51	13	4	1	1	2
Reading, Pa.	26	21	5	-	-	-	7
Rochester, N.Y.	97	79	15	2	-	1	12
Schenectady, N.Y.	12	10	2	-	-	-	1
Scranton, Pa.†	35	26	7	2	-	-	1
Syracuse, N.Y.	52	39	7	3	-	3	3
Trenton, N.J.	34	21	6	2	-	5	3
Utica, N.Y.	19	14	5	-	-	-	3
Yonkers, N.Y.	26	22	3	1	-	-	4
E.N. CENTRAL	2,306	1,510	483	162	67	83	111
Akron, Ohio	65	38	14	5	2	6	-
Canton, Ohio	47	32	11	3	1	-	4
Chicago, Ill.§	564	362	125	45	10	22	16
Cincinnati, Ohio	199	135	35	13	7	9	18
Cleveland, Ohio	141	93	25	12	4	7	3
Columbus, Ohio	123	64	30	13	7	8	-
Dayton, Ohio	102	76	21	4	1	-	6
Detroit, Mich.	230	143	47	18	11	11	5
Evansville, Ind.	30	25	3	2	-	-	1
Fort Wayne, Ind.	48	34	9	2	1	2	9
Gary, Ind.	19	9	8	1	-	1	-
Grand Rapids, Mich.	44	29	11	4	-	-	3
Indianapolis, Ind.	166	99	43	14	6	4	2
Madison, Wis.	41	25	8	5	1	2	4
Milwaukee, Wis.	136	108	22	3	1	2	4
Peoria, Ill.	50	29	7	4	8	2	3
Rockford, Ill.	40	28	9	1	1	1	2
South Bend, Ind.	78	52	17	3	4	2	12
Toledo, Ohio	116	82	23	7	1	3	11
Youngstown, Ohio	67	47	15	3	1	1	8
W.N. CENTRAL	732	547	105	32	24	24	48
Des Moines, Iowa	62	45	11	1	2	3	7
Duluth, Minn.	24	20	2	1	1	-	2
Kansas City, Kans.	35	22	7	2	3	1	3
Kansas City, Mo.	119	87	15	9	3	5	12
Lincoln, Nebr.	32	28	2	1	1	-	3
Minneapolis, Minn.	134	92	25	6	4	7	15
Omaha, Nebr.	86	62	17	2	4	1	3
St. Louis, Mo.	163	131	14	7	5	6	3
St. Paul, Minn.	60	46	9	3	1	1	-
Wichita, Kans.§	17	14	3	-	-	-	-
S. ATLANTIC	1,572	921	333	179	56	82	79
Atlanta, Ga.	154	89	26	22	6	11	4
Baltimore, Md.	217	130	50	25	3	9	15
Charlotte, N.C.	110	65	24	15	3	3	11
Jacksonville, Fla.	141	88	35	14	2	2	10
Miami, Fla.	113	67	20	17	4	5	-
Norfolk, Va.	61	32	16	5	3	5	2
Richmond, Va.	73	44	21	4	1	3	11
Savannah, Ga.	39	29	7	1	1	1	2
St. Petersburg, Fla.	69	51	7	5	1	5	3
Tampa, Fla.	74	53	10	3	4	3	4
Washington, D.C.	496	253	113	67	28	35	16
Wilmington, Del.	25	20	4	1	-	-	1
E.S. CENTRAL	759	530	142	37	26	24	45
Birmingham, Ala.	131	92	21	9	4	5	4
Chattanooga, Tenn.	54	39	10	1	3	1	9
Knoxville, Tenn.	67	55	7	1	2	2	7
Louisville, Ky.	79	46	20	5	1	7	6
Memphis, Tenn.	169	114	33	11	9	2	9
Mobile, Ala.	88	67	14	1	3	3	4
Montgomery, Ala.	46	36	9	1	-	-	3
Nashville, Tenn.	125	81	28	8	4	4	3
W.S. CENTRAL	1,749	1,056	388	189	61	55	76
Austin, Tex.	51	30	9	5	3	4	1
Baton Rouge, La.	40	25	5	5	3	2	4
Corpus Christi, Tex.	42	30	8	2	2	-	1
Dallas, Tex.	223	137	52	24	7	3	11
El Paso, Tex.	52	29	12	6	1	4	1
Fort Worth, Tex	130	80	22	15	5	8	10
Houston, Tex.§	734	436	169	89	24	16	18
Little Rock, Ark.	74	42	13	7	6	6	9
New Orleans, La.	111	61	31	14	2	3	-
San Antonio, Tex.	178	107	45	15	4	7	13
Shreveport, La.	32	23	8	1	-	-	6
Tulsa, Okla.	82	56	14	6	4	2	2
MOUNTAIN	711	455	162	49	22	23	34
Albuquerque, N. Mex.	78	52	13	4	5	4	5
Colo. Springs, Colo.	40	27	9	3	-	1	5
Denver, Colo.	99	66	18	9	2	4	5
Las Vegas, Nev.	106	56	37	7	3	3	10
Ogden, Utah	24	17	4	3	-	-	1
Phoenix, Ariz.	178	106	51	13	4	4	3
Pueblo, Colo.	20	15	3	2	-	-	1
Salt Lake City, Utah	56	33	9	3	6	5	2
Tucson, Ariz.	110	83	18	5	2	2	2
PACIFIC	1,923	1,222	372	197	72	53	112
Berkeley, Calif.	20	15	4	1	-	-	-
Fresno, Calif.	53	39	5	5	3	1	5
Glendale, Calif.	40	28	6	4	1	1	1
Honolulu, Hawaii	67	42	16	3	4	2	13
Long Beach, Calif.	82	47	16	11	3	5	11
Los Angeles Calif.	581	344	117	76	29	8	18
Oakland, Calif.§	94	63	18	9	2	2	5
Pasadena, Calif.	29	21	3	-	1	4	2
Portland, Oreg.	133	82	32	8	1	10	7
Sacramento, Calif.	122	81	26	8	3	4	11
San Diego, Calif.	138	92	22	15	6	3	11
San Francisco, Calif.	160	93	34	27	2	4	4
San Jose, Calif.	162	108	34	14	1	5	13
Seattle, Wash.	151	101	21	12	14	3	1
Spokane, Wash.	62	49	9	3	-	1	6
Tacoma, Wash.	29	17	9	1	2	-	4
TOTAL	13,539††	8,757	2,742	1,186	410	435	763

*Mortality data in this table are voluntarily reported from 121 cities in the United States, most of which have populations of 100,000 or more. A death is reported by the place of its occurrence and by the week that the death certificate was filed. Fetal deaths are not included.

**Pneumonia and influenza.

†Because of changes in reporting methods in these 3 Pennsylvania cities, these numbers are partial counts for the current week. Complete counts will be available in 4 to 6 weeks.

††Total includes unknown ages.

§Data not available. Figures are estimates based on average of past available 4 weeks.

ACIP: Influenza — Continued

An increase in mortality further indicates the impact of influenza epidemics. Increased mortality results from not only pneumonia but also cardiopulmonary or other chronic diseases that can be exacerbated by influenza infection. Ten thousand or more excess deaths have been documented in each of 19 different epidemics during 1957–1986; more than 40,000 excess deaths occurred in each of several recent epidemics. Approximately 80%–90% of the excess deaths attributed to pneumonia and influenza were among persons ≥65 years of age. However, influenza-associated deaths also occur in children and previously healthy adults <65 years of age during major epidemics.

Because the proportion of elderly persons in the U.S. population is increasing and because age and its associated chronic diseases are risk factors for severe influenza illness, the toll from influenza can be expected to increase unless control measures are used more vigorously. The number of younger persons at high risk for infection-related complications is also increasing for various reasons, such as the success of neonatal intensive-care units, better management of diseases such as cystic fibrosis, and better survival rates for organ-transplant recipients.

OPTIONS FOR THE CONTROL OF INFLUENZA

Two measures are available in the United States to reduce the impact of influenza: immunoprophylaxis with inactivated (killed-virus) vaccine and chemoprophylaxis or therapy with an influenza-specific antiviral drug (e.g., amantadine). Vaccination of high-risk persons each year before the influenza season is the most important measure for reducing the impact of influenza. Vaccination can be highly cost-effective 1) when it is aimed at persons who are most likely to experience complications or who have a higher-than-average risk for exposure and 2) when it is administered to high-risk persons during a hospitalization or routine health-care visit before the influenza season, thus making special visits to physicians' offices or clinics unnecessary. Recent reports indicate that, when vaccine and epidemic strains of virus are well matched, achieving high vaccination rates in closed populations can reduce the risk of outbreaks by inducing herd immunity. When outbreaks of influenza A occur in closed populations, they can be interrupted by chemoprophylaxis for all residents. (Additional information on chemoprophylaxis will be published in the *MMWR* before the 1989–90 season.)

Other indications for immunization include the strong desire of any person to avoid an influenza infection, reduce the severity of disease, or reduce the chances of transmitting influenza to high-risk persons with whom they have frequent contact.

INACTIVATED VACCINE FOR INFLUENZA A AND B

Influenza vaccine is made from highly purified, egg-grown viruses that have been rendered noninfectious (inactivated). Influenza vaccine contains three virus strains (two type A and one type B) representing influenza viruses recently circulating worldwide and believed likely to circulate in the United States the following winter. The composition of the vaccine is such that it causes minimal systemic or febrile reactions. Whole-virus, subvirion, and purified surface antigen preparations are available. Only subvirion or purified surface antigen preparations should be used for children to minimize febrile reactions. Subvirion, purified surface antigen, or whole-virus vaccines may be used in adults. Most vaccinated children and young adults develop high postvaccination hemagglutination-inhibition antibody titers that are likely to protect them against infection by strains like those in the vaccine and often

ACIP: Influenza – Continued

by related variants that may emerge. Elderly persons and persons with certain chronic diseases may develop lower postvaccination antibody titers than healthy young adults and thus may remain susceptible to influenza upper-respiratory-tract infection. Nevertheless, influenza vaccine can still be effective in preventing lower-respiratory-tract involvement or other complications, thereby reducing the risk of hospitalization and death.

RECOMMENDATIONS FOR USE OF INACTIVATED INFLUENZA VACCINE

Influenza vaccine is strongly recommended for any person ≥6 months of age who, by virtue of age or underlying medical condition, is at increased risk for complications of influenza. It is also strongly recommended for health-care workers and others (including household members) who may have close contact with high-risk persons. In addition, influenza vaccine may be given to any other person who wishes to reduce his/her chance of becoming infected with influenza, even if that person is not at increased risk for complications.

Vaccine composition and dosages for the 1989–90 season are given in Table 1. Guidelines for the use of vaccine among different groups are given below.

Although the current influenza vaccine often contains one or more antigens used in previous years, immunity declines in the year following vaccination. Therefore, annual vaccination using the current vaccine is required. Remaining 1988–89 vaccine should not be used to provide protection for the 1989–90 influenza season.

Two doses may be required for a satisfactory antibody response in previously unvaccinated children ≤12 years of age; however, clinical studies with vaccines similar to those in current use have shown only marginal or no improvement in antibody response when a second dose is given to adults during the same season.

During the past decade, data on influenza vaccine immunogenicity and side effects have generally been obtained when vaccine has been administered intramuscularly.

TABLE 1. Influenza vaccine* dosage, by patient age – United States, 1989–90 season

Age group	Product†	Dosage	No. doses	Route§
6–35 mos	Split virus only	0.25 mL	1 or 2¶	IM
3–12 yrs	Split virus only	0.50 mL	1 or 2¶	IM
>12 yrs	Whole or split virus	0.50 mL	1	IM

*Contains 15 μg each of A/Taiwan/1/86-like (H1N1), A/Shanghai/11/87-like (H3N2), and B/Yamagata/16/88-like hemagglutinin antigens in each 0.5 mL. Manufacturers include: Connaught Laboratories, Inc. (distributed by E.R. Squibb & Sons Inc.) (Fluzone® whole or split); Parke-Davis (Fluogen® split); and Wyeth-Ayerst Laboratories (Influenza Virus Vaccine, Trivalent® split). For further product information call Connaught, (800) 822-2463; Parke-Davis, (800) 223-0432; Wyeth-Ayerst, (800) 321-2304. A fourth vaccine, manufactured by Evans Medical Ltd. and distributed by Lederle Laboratories (purified surface antigen vaccine), may be available for the the 1989-90 influenza season. Further information can be obtained from Lederle Laboratories, telephone [800] 533-3753.

†Because of the lower potential for causing febrile reactions, only split-virus vaccines should be used in children ("split virus" refers to viruses that have been chemically treated to reduce the level of potentially pyrogenic components). They may be labeled as "split," "subvirion," or "purified surface antigen" vaccine. Immunogenicity and side effects of split- and whole-virus vaccines are similar in adults when vaccines are used according to the recommended dosage.

§The recommended site of vaccination is the deltoid muscle for adults and older children. The preferred site for infants and young children is the anterolateral aspect of the thigh.

¶Two doses are recommended for children ≤12 years old who are receiving influenza vaccine for the first time.

ACIP: Influenza — Continued

Because there has been no adequate evaluation of recent influenza vaccines administered by other routes, the intramuscular route should be used. Adults and older children should be vaccinated in the deltoid muscle, and infants and young children, in the anterolateral aspect of the thigh.

TARGET GROUPS FOR SPECIAL VACCINATION PROGRAMS

To maximize protection of high-risk persons, both the persons at risk and their close contacts should be targeted for organized vaccination programs.

Groups at Increased Risk for Influenza-Related Complications

1. Adults and children with chronic disorders of the pulmonary or cardiovascular systems, including children with asthma.
2. Residents of nursing homes and other chronic-care facilities housing patients of any age with chronic medical conditions.
3. Persons ≥65 years of age.
4. Adults and children who have required regular medical follow-up or hospitalization during the preceding year because of chronic metabolic diseases (including diabetes mellitus), renal dysfunction, hemoglobinopathies, or immunosuppression.
5. Children and teenagers (aged 6 months–18 years) who are receiving long-term aspirin therapy and therefore may be at risk of developing Reye syndrome after an influenza infection.

Groups Potentially Capable of Transmitting Influenza to High-Risk Persons

Persons attending high-risk persons can transmit influenza infections to them while they themselves are undergoing subclinical infection or working despite the existence of symptoms. Some high-risk persons (e.g., the elderly, transplant recipients, or persons with acquired immunodeficiency syndrome [AIDS]) can have relatively low antibody responses to influenza vaccine. Efforts to protect them against influenza may be improved by reducing the chances that their care providers may expose them to influenza. Therefore, the following groups should be vaccinated:

1. Physicians, nurses, and other personnel in both hospital and outpatient-care settings who have extensive contact with high-risk patients in all age groups, including infants.
2. Providers of home care to high-risk persons (e.g., visiting nurses, volunteer workers).
3. Household members (including children) of high-risk persons.

VACCINATION OF OTHER GROUPS

General Population

Physicians should administer influenza vaccine to any person who wishes to reduce his/her chances of acquiring influenza infection. Persons who provide essential community services and students or other persons in institutional settings (i.e., schools and colleges) may be considered for vaccination to minimize the disruption of routine activities during outbreaks.

Pregnant Women

Influenza-associated excess mortality among pregnant women has not been documented, except in the largest pandemics of 1918–19 and 1957–58. However, pregnant women who have other medical conditions that increase their risk for complications from influenza should be vaccinated, as the vaccine is considered safe

ACIP: Influenza — Continued

for pregnant women. Administering the vaccine after the first trimester is a reasonable precaution to minimize any concern over the theoretical risk of teratogenicity. However, it is undesirable to delay vaccination of pregnant women with high-risk conditions who will still be in the first trimester of pregnancy when the influenza season begins.

Persons Infected with HIV

Increases in infections and complications caused by various respiratory pathogens have been observed in persons infected with HIV. However, similar increases due to influenza have not been reported during recent epidemics. Nevertheless, because influenza may result in serious illness and complications in some HIV-infected persons, vaccination is a prudent precaution.

Foreign Travelers

Increasingly, the elderly and persons with high-risk medical conditions are embarking on international travel. The risk of exposure to influenza during foreign travel varies, depending on, among other factors, season of travel and destination. Influenza can occur throughout the year in the tropics; the season of greatest influenza activity in the Southern Hemisphere is April–September. Because of the short incubation period for influenza, exposure to the virus during travel will often result in clinical illness that begins during travel, an inconvenience or potential danger, especially for persons at increased risk for complications. Persons preparing to travel to the tropics at any time of year or to the Southern Hemisphere during April–September should review their vaccination histories. If not vaccinated the previous fall/winter, they should be considered for influenza vaccination before travel. Persons in the high-risk categories especially should be encouraged to receive the vaccine. The most current available vaccine should be used. High-risk persons given the previous season's vaccine before travel should be revaccinated in the fall/winter with current vaccine.

PERSONS WHO SHOULD NOT BE VACCINATED

Inactivated influenza vaccine should not be given to persons known to have an anaphylactic hypersensitivity to eggs (see below: Side Effects and Adverse Reactions).

Persons with acute febrile illnesses usually should not be vaccinated until their symptoms have abated.

SIDE EFFECTS AND ADVERSE REACTIONS

Because influenza vaccine contains only noninfectious viruses, it cannot cause influenza. Occasional cases of respiratory disease following vaccination represent coincidental illnesses unrelated to influenza vaccination. The most frequent side effect of vaccination is soreness around the vaccination site for up to 2 days; this occurs in less than one third of vaccinees.

In addition, the following two types of systemic reactions have occurred:

1. Fever, malaise, myalgia, and other systemic symptoms occur infrequently and most often affect persons who have had no exposure to the influenza virus antigens in the vaccine (e.g., young children). These reactions begin 6–12 hours after vaccination and can persist for 1 or 2 days.
2. Immediate, presumably allergic, reactions (such as hives, angioedema, allergic asthma, or systemic anaphylaxis) occur extremely rarely after influenza vaccination. These reactions probably result from hypersensitivity to some vaccine component—most likely residual egg protein. Although current influ-

ACIP: Influenza — Continued

enza vaccines contain only a small quantity of egg protein, this protein is presumed capable of inducing immediate hypersensitivity reactions in persons with severe egg allergy, and such persons should not be given influenza vaccine, including persons who develop hives, have swelling of the lips or tongue, or experience acute respiratory distress or collapse after eating eggs. Persons with a documented immunoglobulin E (IgE)-mediated hypersensitivity to eggs, including those who have had occupational asthma or other allergic responses from occupational exposure to egg protein, may also be at increased risk for reactions from influenza vaccine.

Unlike the 1976 swine influenza vaccine, subsequent vaccines prepared from other virus strains have not been associated with an increased frequency of Guillain-Barré syndrome. Although influenza vaccination can inhibit the clearance of warfarin and theophylline, clinical studies have consistently failed to show any adverse effects attributable to these drugs in patients receiving influenza vaccine.

SIMULTANEOUS ADMINISTRATION OF OTHER VACCINES, INCLUDING CHILDHOOD VACCINES

The target groups for influenza and pneumococcal vaccination overlap considerably. Both vaccines can be given at the same time at different sites without increasing side effects. However, influenza vaccine must be given annually, and with few exceptions, pneumococcal vaccine should be given only once.

High-risk children usually see a health professional to receive routine pediatric vaccines. These visits provide a good opportunity to administer influenza vaccine simultaneously but in a different site. Although studies have not been conducted, simultaneous administration should not diminish immunogenicity or increase adverse reactions.

TIMING OF INFLUENZA VACCINATION ACTIVITIES

Influenza vaccine may be offered to high-risk persons presenting for routine care or hospitalization beginning in September but *not* until new vaccine is available. Except in years of pandemic influenza (e.g., 1957 and 1968), high levels of influenza activity generally do not occur in the contiguous 48 states before December. Therefore, organized vaccination campaigns in which high-risk persons are routinely accessible are *optimally* undertaken in November. In facilities such as nursing homes, it is particularly important to avoid administering vaccine too far in advance of the influenza season because antibody level begins to decline within a few months. Such vaccination programs may be undertaken as soon as current vaccine is available in September or October if regional influenza activity is expected to begin earlier than usual.

Children ≤12 years of age who have not been vaccinated previously should receive two doses at least 1 month apart to maximize the chance of a satisfactory antibody response to all three vaccine antigens. The second dose should be given before December, if possible. Vaccine should continue to be offered to both children and adults up to and even after influenza virus activity is documented in a community, which may be as late as April in some years.

STRATEGIES FOR IMPLEMENTING INFLUENZA VACCINE RECOMMENDATIONS

Despite the recognition that optimum medical care for both adults and children includes regular review of immunization records and administration of vaccines as appropriate, in recent years, an average of <30% of persons in high-risk groups have

ACIP: Influenza — Continued

received influenza vaccine each year. More effective strategies for delivering vaccine to high-risk persons, their health-care providers, and their household contacts are clearly needed.

In general, successful vaccination programs have been those that have combined education for health-care workers, publicity and education targeted toward potential recipients, a routine for identifying (usually by medical record review) persons at risk, and efforts to remove administrative and financial barriers that prevent persons from receiving the vaccine.

Persons for whom influenza vaccine is recommended can be identified and immunized in the following settings:

Outpatient Clinics and Physicians' Offices

Staff in physicians' offices, clinics, health maintenance organizations, and employee health clinics should be instructed to identify and mark the medical records of patients who should receive vaccine. Vaccine should be offered during visits beginning in September and continuing through the influenza season. Offer of vaccine and its receipt or refusal should be documented in the medical record. Patients in high-risk groups who do not have regularly scheduled visits during the fall should be reminded by mail or telephone of the need for vaccine, and if possible, arrangements should be made to provide vaccine with minimal waiting time and at the lowest possible cost.

Facilities Providing Episodic or Acute Care (e.g., emergency rooms, walk-in clinics)

Health-care providers in these settings should be familiar with influenza vaccine recommendations and should offer vaccine to persons in high-risk groups or should provide written information on why, where, and how to obtain the vaccine. Written information should be available in Spanish or other language(s) appropriate for the population served by the facility.

Nursing Homes and Other Residential Long-Term Care Facilities

Immunization should be routinely provided to residents of chronic-care facilities, with concurrence of physicians, rather than by procuring orders for administration of vaccine for each patient. Consent for immunization should be obtained at the time of admission to the facility, and all residents immunized at one period of time immediately preceding the influenza season. Residents admitted after completion of the vaccination program should be immunized at the time of admission during the winter months.

Acute-Care Hospitals

Patients of any age in medically high-risk groups and all persons ≥65 years of age who are hospitalized from September through March should be offered and strongly encouraged to receive vaccine before discharge. Household members and others with whom they will have contact should receive written information about reasons they should also receive influenza vaccine and places to obtain the vaccine.

Outpatient Facilities Providing Continuing Care to High-Risk Patients (e.g., hemodialysis centers, hospital specialty-care clinics, outpatient rehabilitation programs)

All patients should be offered vaccine at one period of time shortly before the beginning of the influenza season. Patients admitted during the winter months after the vaccination program should be immunized at the time of admission for care. Household members should receive written information regarding need for immunization and places to obtain the vaccine.

ACIP: Influenza — Continued

Visiting Nurses and Others Providing Home Care to High-Risk Persons

Nursing-care plans should identify high-risk patients, and vaccine should be provided in the home if necessary. Caregivers and others in the household should be referred for immunization.

Facilities Providing Services to Persons ≥65 Years of Age (e.g., retirement communities, recreation centers)

If possible, all unimmunized residents/attendees should be offered vaccine on site at one time period before the influenza season; alternatively, education/publicity programs should emphasize need for vaccine and should provide specific information on how, where, and when to obtain it.

Clinics and Others Providing Health Care for Travelers

Indications for influenza vaccine should be reviewed before travel and vaccine offered if appropriate (see previous section: Vaccination for Foreign Travelers).

Health-Care Workers

Administrators of all of the above facilities and organizations should arrange for influenza vaccine to be offered to all personnel before the influenza season. Personnel should be provided with appropriate educational materials and strongly encouraged to receive vaccine, with particular emphasis on immunization of persons caring for highest-risk patients (i.e., staff of intensive-care units [including newborn intensive-care units] and chronic-care facilities). Use of a mobile cart to take vaccine to hospital wards or other worksites, and availability of vaccine during night and weekend workshifts may enhance compliance, as may a follow-up campaign if an outbreak threatens.

SOURCES OF INFORMATION ON INFLUENZA-CONTROL PROGRAMS

Educational materials about influenza and its control are available from a variety of sources, including CDC. For information on sources of educational materials, contact Technical Information Services, Center for Prevention Services, Mailstop E-07, CDC, Atlanta, GA 30333.

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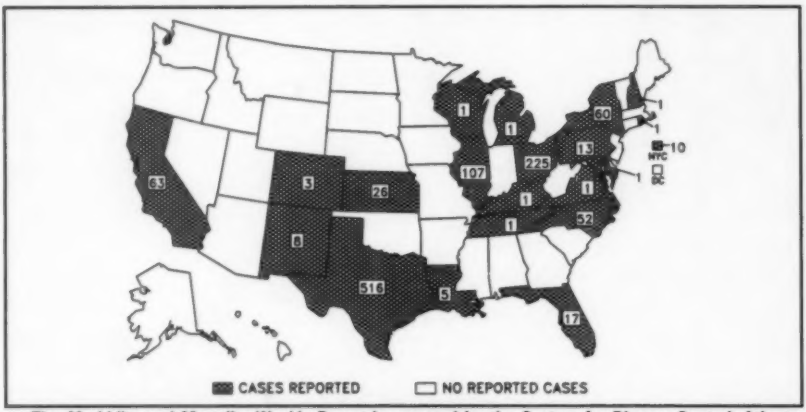
Errata: Vol. 38, No. 13

Two errors appeared in tables in the "General Recommendations on Immunization" article. In Table 1 on page 207, the "Route" column for rabies vaccine should be "Intramuscular or intradermal[§]" instead of as published. In Table 2 on page 211, the last line of the first entry under the "Comments" heading should be ". . . aged 18 mos through 4 yrs (up to the fifth birthday)," instead of as published.

FIGURE I. Reported measles cases — United States, weeks 13–16, 1989



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The data in this report are provisional, based on weekly reports to CDC by state health departments. The reporting week concludes at close of business on Friday; compiled data on a national basis are officially released to the public on the succeeding Friday. The editor welcomes accounts of interesting cases, outbreaks, environmental hazards, or other public health problems of current interest to health officials. Such reports and any other matters pertaining to editorial or other textual considerations should be addressed to: Editor, *Morbidity and Mortality Weekly Report*, Centers for Disease Control, Atlanta, Georgia 30333; telephone (404) 332-4555.

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